

**WHAT IS CLAIMED:**

*Sub  
G3* 1. An isolated nucleic acid molecule encoding a protein which regulates fruit size and/or cell division in plants.

5 2. An isolated nucleic acid molecule according to claim 1, wherein the nucleic acid molecule is a plant nucleic acid molecule.

3. An isolated nucleic acid molecule according to claim 1, wherein the nucleic acid molecule is a *fw2.2* gene.

10 4. An isolated nucleic acid molecule according to claim 1, wherein the nucleic acid molecule encodes a protein which reduces fruit size and/or cell division in plants.

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G3* 5. An isolated nucleic acid molecule according to claim 4, wherein the nucleic acid has a nucleotide sequence of SEQ. ID. No. 1.

6. An isolated nucleic acid molecule according to claim 4, wherein the nucleic acid molecule encodes a protein having an amino acid sequence of SEQ. ID. No. 2.

20 7. An isolated nucleic acid molecule according to claim 4, wherein the nucleic acid molecule hybridizes to a nucleic acid molecule having a nucleotide sequence of SEQ. ID. No. 1 under stringent conditions characterized by 25 a hybridization buffer comprising 0.9M sodium citrate buffer at a temperature of 45°C.

8. An isolated nucleic acid molecule according to claim 1, wherein the nucleic acid molecule encodes a protein which increases fruit size and/or cell division in plants.

9. An isolated nucleic acid molecule according to claim 8,  
wherein the nucleic acid molecule has a nucleotide sequence of SEQ. ID. No. 3.

10. An isolated nucleic acid molecule according to claim 8,  
5 wherein the nucleic acid molecule encodes a protein having an amino acid  
sequence of SEQ. ID. No. 4.

11. An isolated nucleic acid molecule according to claim 8,  
wherein the nucleic acid molecule hybridizes to a nucleic acid molecule having a  
10 nucleotide sequence of SEQ. ID. No. 3 under stringent conditions characterized by  
a hybridization buffer comprising 0.9M sodium citrate buffer at a temperature of  
45°C.

12. An expression vector comprising a transcriptional and  
15 translational regulatory DNA molecule operably linked to a nucleic acid molecule  
according to claim 1.

13. An expression vector according to claim 12, wherein the  
DNA molecule is in proper sense orientation and correct reading frame.  
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14. A host cell transduced with the nucleic acid according to  
claim 1.

15. A host cell according to claim 14, wherein the cell is  
25 selected from a group consisting of a bacterial cell, a yeast cell, and a plant cell.

16. A host cell according to claim 15, wherein the cell is a plant  
cell selected from a group consisting of alfalfa, rice, wheat, barley, rye, cotton,  
sunflower, peanut, corn, potato, sweet potato, bean pea, chicory, lettuce, endive,  
30 cabbage, brussel sprout, beet, parsnip, cauliflower, broccoli, turnip, radish,  
spinach, onion, garlic, eggplant, pepper, celery, carrot, squash, pumpkin, zucchini,  
cucumber, apple, pear, melon, citrus, strawberry, grape, raspberry, pineapple,  
soybean, tobacco, tomato, sorghum, and sugarcane.

17. A host cell according to claim 15, wherein the cell is a plant cell selected from the group consisting of *Arabidopsis thaliana*, *Saintpaulia*, petunia, pelargonium, poinsettia, chrysanthemum, carnation, and zinnia.

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~~18. A host cell according to claim 14, wherein the nucleic acid molecule encodes a protein which reduces fruit size and/or cell division in plants.~~

19. A host cell according to claim 18, wherein the nucleic acid  
10 molecule either 1) encodes a protein or polypeptide having an amino acid sequence of SEQ. ID. No. 2, 2) has a nucleotide sequence of SEQ. ID. No. 1, or 3) hybridizes to a nucleic acid molecule having a nucleotide sequence of SEQ. ID. No. 1 under stringent conditions characterized by a hybridization buffer comprising 0.9M sodium citrate buffer at a temperature at a temperature of 45°C.

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20. A host cell according to claim 14, wherein the nucleic acid molecule encodes a protein which increases fruit size and/or cell division in plants.

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21. A host cell according to claim 20, wherein the nucleic acid molecule either 1) encodes a protein or polypeptide having an amino acid sequence of SEQ. ID. No. 4, 2) has a nucleotide sequence of SEQ. ID. No. 3, or 3) hybridizes to a nucleic acid molecule having a nucleotide sequence of SEQ. ID. No. 3 under stringent conditions characterized by a hybridization buffer comprising 0.9M sodium citrate buffer at a temperature at a temperature of 45°C.

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22. A transgenic plant transformed with the nucleic acid

molecule according to claim 1.

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23. A transgenic plant according to claim 22, wherein the plant is selected from a group consisting of alfalfa, rice, wheat, barley, rye, cotton, sunflower, peanut, corn, potato, sweet potato, bean pea, chicory, lettuce, endive, cabbage, brussel sprout, beet, parsnip, cauliflower, broccoli, turnip, radish,

spinach, onion, garlic, eggplant, pepper, celery, carrot, squash, pumpkin, zucchini, cucumber, apple, pear, melon, citrus, strawberry, grape, raspberry, pineapple, soybean, tobacco, tomato, sorghum, and sugarcane.

5           24. A transgenic plant according to claim 22, wherein the plant  
is selected from the group consisting of *Arabidopsis thaliana*, *Saintpaulia*,  
petunia, pelargonium, poinsettia, chrysanthemum, carnation, and zinnia.

10          25. A transgenic plant according to claim 22, wherein the  
nucleic acid molecule encodes a protein reducing fruit size and/or cell division in  
plants.

15          26. A transgenic plant according to claim 25, wherein the  
nucleic acid molecule either 1) encodes a protein or polypeptide having an amino  
acid sequence of SEQ. ID. No. 2, 2) has a nucleotide sequence of SEQ. ID. No. 1,  
or 3) hybridizes to a nucleic acid molecule having a nucleotide sequence of SEQ.  
ID. No. 1 under stringent conditions characterized by a hybridization buffer  
comprising 0.9M sodium citrate buffer at a temperature of 45°C.

20          27. A transgenic plant according to claim 22, wherein the  
nucleic acid molecule encodes a protein increasing fruit size and/or cell division in  
plants.

25          28. A transgenic plant according to claim 27, wherein the  
nucleic acid molecule either 1) encodes a protein or polypeptide having an amino  
acid sequence of SEQ. ID. No. 4, 2) has a nucleotide sequence of SEQ. ID. No. 3,  
or 3) hybridizes to a nucleic acid molecule having a nucleotide sequence of SEQ.  
ID. No. 3 under stringent conditions characterized by a hybridization buffer  
comprising 0.9M sodium citrate buffer at a temperature of 45°C.

30          29. A transgenic plant seed transformed with the nucleic acid  
molecule according to claim 1.

30. A transgenic plant seed according to claim 29, wherein the plant is selected from a group consisting of alfalfa, rice, wheat, barley, rye, cotton, sunflower, peanut, corn, potato, sweet potato, bean pea, chicory, lettuce, endive, cabbage, brussel sprout, beet, parsnip, cauliflower, broccoli, turnip, radish, 5 spinach, onion, garlic, eggplant, pepper, celery, carrot, squash, pumpkin, zucchini, cucumber, apple, pear, melon, citrus, strawberry, grape, raspberry, pineapple, soybean, tobacco, tomato, sorghum, and sugarcane.

10 31. A transgenic plant seed according to claim 29, wherein the plant is selected from the group consisting of *Arabidopsis thaliana*, *Saintpaulia*, petunia, pelargonium, poinsettia, chrysanthemum, carnation, and zinnia.

15 32. A transgenic plant seed according to claim 29 wherein the nucleic acid molecule encodes a protein reducing fruit size and/or cell division in plants.

20 33. A transgenic plant seed according to claim 32, wherein the nucleic acid molecule either 1) encodes a protein or polypeptide having an amino acid sequence of SEQ. ID. No. 2, 2) has a nucleotide sequence of SEQ. ID. No. 1, or 3) hybridizes to a nucleic acid molecule having a nucleotide sequence of SEQ. ID. No. 1 under stringent conditions characterized by a hybridization buffer comprising 0.9M sodium citrate buffer at a temperature of 45°C.

25 34. A transgenic plant seed according to claim 29, wherein the nucleic acid molecule encodes a protein increasing fruit size and/or cell division in plants.

30 35. A transgenic plant seed according to claim 34, wherein the nucleic acid molecule either 1) encodes a protein or polypeptide having an amino acid sequence of SEQ. ID. No. 4, 2) has a nucleotide sequence of SEQ. ID. No. 3, or 3) hybridizes to a nucleic acid molecule having a nucleotide sequence of SEQ. ID. No. 3 under stringent conditions characterized by a hybridization buffer comprising 0.9M sodium citrate buffer at a temperature of 45°C.

*Su  
S4* > 36.

A method of regulating fruit size in plants comprising:  
transforming a plant with a nucleic acid molecule according to claim 1  
under conditions effective to regulate fruit size in the plant.

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37. A method according to claim 36, wherein the plant is  
selected from the group consisting of alfalfa, rice, wheat, barley, rye, cotton,  
sunflower, peanut, corn, potato, sweet potato, bean pea, chicory, lettuce, endive,  
cabbage, brussel sprout, beet, parsnip, cauliflower, broccoli, turnip, radish,  
10 spinach, onion, garlic, eggplant, pepper, celery, carrot, squash, pumpkin, zucchini,  
cucumber, apple, pear, melon, citrus, strawberry, grape, raspberry, pineapple,  
soybean, tobacco, tomato, sorghum, and sugarcane.

15 38. A method according to claim 36, wherein the plant is  
selected from the group consisting of *Arabidopsis thaliana*, *Saintpaulia*, petunia,  
pelargonium, poinsettia, chrysanthemum, carnation, and zinnia.

20 39. A method according to claim 36, wherein the nucleic acid  
molecule encodes a protein which reduces fruit size in plants.

25 40. A method according to claim 39, wherein the nucleic acid  
molecule either 1) encodes a protein or polypeptide having an amino acid  
sequence of SEQ. ID. No. 2, 2) has a nucleotide sequence of SEQ. ID. No. 1, or 3)  
hybridizes to a nucleic acid molecule having a nucleotide sequence of SEQ. ID.  
No. 1 under stringent conditions characterized by a hybridization buffer  
comprising 0.9M sodium citrate buffer at a temperature of 45°C.

30 41. A method according to claim 36, wherein the nucleic acid  
molecule encodes a protein which increases fruit size in plants.

42. A method according to claim 41, wherein the nucleic acid  
molecule either 1) encodes a protein or polypeptide having an amino acid  
sequence of SEQ. ID. No. 4, 2) has a nucleotide sequence of SEQ. ID. No. 3, or 3)

hybridizes to a nucleic acid molecule having a nucleotide sequence of SEQ. ID. No. 3 under stringent conditions characterized by a hybridization buffer comprising 0.9M sodium citrate buffer at a temperature of 45°C

5      *Subj 43* A method of regulating cell division in plants comprising:  
transforming a plant with a nucleic acid molecule according  
to claim 1 under conditions effective to regulate cell division in the plant.

44.     A method according to claim 43, wherein the plant is  
10    selected from the group consisting of alfalfa, rice, wheat, barley, rye, cotton,  
sunflower, peanut, corn, potato, sweet potato, bean pea, chicory, lettuce, endive,  
cabbage, brussel sprout, beet, parsnip, cauliflower, broccoli, turnip, radish,  
spinach, onion, garlic, eggplant, pepper, celery, carrot, squash, pumpkin, zucchini,  
cucumber, apple, pear, melon, citrus, strawberry, grape, raspberry, pineapple,  
15    soybean, tobacco, tomato, sorghum, and sugarcane.

45.     A method according to claim 43, wherein the plant is  
selected from the group consisting of *Arabidopsis thaliana*, *Saintpaulia*, petunia,  
pelargonium, poinsettia, chrysanthemum, carnation, and zinnia.

20      46.     A method according to claim 43, wherein the nucleic acid  
molecule encodes a protein which reduces cell division in plants.

47.     A method according to claim 46, wherein the nucleic acid  
25    molecule either 1) encodes a protein or polypeptide having an amino acid  
sequence of SEQ. ID. No. 2, 2) has a nucleotide sequence of SEQ. ID. No. 1, or 3)  
hybridizes to a nucleic acid molecule having a nucleotide sequence of SEQ. ID.  
No. 1 under stringent conditions characterized by a hybridization buffer  
comprising 0.9M sodium citrate buffer at a temperature of 45°C.

30      48.     A method according to claim 43, wherein the nucleic acid  
molecule encodes a protein which increases cell division in plants.

~~49. A method according to claim 48, wherein the nucleic acid molecule either 1) encodes a protein or polypeptide having an amino acid sequence of SEQ. ID. No. 4, 2) has a nucleotide sequence of SEQ. ID. No. 3, or 3) hybridizes to a nucleic acid molecule having a nucleotide sequence of SEQ. ID.~~

5 No. 3 under stringent conditions characterized by a hybridization buffer comprising 0.9M sodium citrate buffer at a temperature of 45°C

50. An isolated protein which regulates fruit size and/or cell division in plants.

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51. An isolated protein according to claim 50, wherein the protein is a *fw2.2* protein.

52. An isolated protein according to claim 50, wherein the protein reduces fruit size and/or reduces cell division in plants.

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54. An isolated protein according to claim 50, wherein the protein increases fruit size and/or increases cell division in plants.

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55. An isolated protein according to claim 54, wherein the protein has an amino acid sequence of SEO, ID. No. 4.

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